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THE AMERICAN GAS LIGHT JOURNAL

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The Public Lighting Tables of the American Meter Company will be found in the page advertisement of that Company.

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[OFFICIAL NOTICE.]

Sixteenth Annual Meeting, Western Gas Association.

SECRETARY'S OFFICE, WESTERN GAS ASSOCIATION,
QUINCY, ILLS., April 10, 1893.

The Sixteenth Annual Meeting of the Western Gas Association will be held at Chicago, on the 17th, 18th and 19th days of May.

The Victoria Hotel will be used as the Association's headquarters, while the business sessions will be conducted in Kinsley's Hall, No. 105 Adams street. It will be recalled by many of our members that our meeting of '88 was held at Kinsley's, and that a more admirable assembly room for our purposes could hardly have been chosen.

While, as above indicated, the Victoria Hotel has been designated as headquarters of the Association, yet the great majority of our members will be compelled to seek accommodations elsewhere, as it has been found impossible to secure any one hotel which is able to provide for all in consequence of the great rush of visitors to the Columbian Exposition, at that time expected. However, there need be no fear on the part of our members as regards securing comfortable quarters and at reasonable prices, provided that rooms are engaged in advance. Rooms should be written for by the 1st day of May at the latest, and the writers should request acknowledgments of their applications from the hotel proprietors, so that there may be no possibility of failure in securing accommodations.

The Local Committee of Arrangements for the Chicago meeting consists of the following named gentlemen: Carl D. Bradley (Chairman), Chas. D. Hauk, A. S. Miller, John Stout, C. F. Bryant, F. K. Waugh, P. S. Dickey, S. S. Stratton, F. R. Persons, H. M. Hubbard, H. D. Harper and Chas. V. Newman. From this general committee the following have been appointed as a special committee on hotel accommodations: S. S. Stratton, A. S. Miller and Chas. V. Newman. The members of said special committee have canvassed the situation thoroughly and report that the following hotels have agreed to provide for the number of guests set opposite their respective names, and at prices as here stated:

Victoria.....	50	guests, at	$2.00 to $5.00	per day.	
Great Northern...	50	"	"	2.00	per day and upwards.
Gore's Hotel	50	"	"	1.50	" "
McCoy's Hotel...	150	"	"	1.50	" "
Saratoga Hotel...	150	"	"	1.00	" "

The hotels above named will be conducted on the European plan exclusively.

The Grand Pacific, operated on the American plan, will provide for 50 of our members, upon receipt of three weeks' notice, at prices ranging from $4 per day, upwards.

The Leland, conducted both upon the American and European plans, will accommodate at their regular rates a limited number of guests upon receiving timely notice from the applicants.

The Rossmore, Wabash avenue, between 18th and 19th streets, a new and finely equipped hotel, especially adapted to family requirements, will take care of 100 guests at their regular rates of $3 to $5 per day. The Rossmore is under the management of the Victoria, which would seem to be a guarantee of excellence.

While the following hotels do not guarantee to reserve accommodations for our members upon receipt of applications, yet a limited number can probably secure rooms if the same are booked at once: The Auditorium, Palmer House and Tremont.

When making applications for quarters, members should write directly to the hotel proprietors and not to the committee on hotel accommodations, although if there is any special information desired beyond that stated in this notice, the members of the committee in question will gladly supply the same.

Further information regarding the papers which will be presented and matters pertaining both to the business and social features of the forthcoming meeting, etc., will be published in subsequent issues of the JOURNAL.

As it is expected that an unusually large number of applications for membership will be made on the occasion of our Sixteenth Annual

Meeting, it is advised that the same be filed at an early day with the undersigned. A. W. LITTLETON, Secretary.

QUINCY, ILLS., April 17, 1893.

The following papers will be presented at the Chicago meeting :

"Practical Gas Analysis, with Experimental Illustrations," by Mr. O. O. Thwing, St. Louis, Mo.

"On the Best Method of Construction of Oil or Naphtha Tanks for Storage Purposes," by Mr. F. D. Moses, Chicago, Ills.

"The Duties of Gas Companies to their Patrons," by Mr. H. D. Walbridge, Grand Rapids, Mich.

"The Relative Economies of Gas Engines and Electric Motors," by Mr. Jas. R. Smedberg, Chicago, Ills.

"Wrinkles," by Mr. Geo. T. Thompson, St. Louis, Mo.

"Residuals ; Ideas Concerning Them Suggested by the Present Outlook," by Mr. James Ferrier, Columbus, Ga.

It will be noticed that the paper list has been somewhat shorn from its usual proportions. In explanation of this fact, it was deemed best by your Executive Committee that this should be done, for the reason that the World's Fair is apt to detract from the attendance at the business meetings, and its attractions may possibly prove so strong to a majority of our members that our usual two days' session may be abbreviated to such an extent that there will not be time for the reading and proper consideration of more than the five papers above enumerated.

In reply to inquiries received regarding transportation rates, I would say that in answer to my request to the railway authorities that the customary reduction of rates be granted, I have received word that on this occasion no reduction from the regular fares will be made, other than those which may happen to be in effect at the time from various points to parties in attendance upon the World's Columbian Exposition.

A complimentary banquet will be tendered to the Association at Kinsley's Hall, on the evening of Thursday, May 18th.

For application blanks, copies of by laws and detailed information not embodied in this notice, please apply to the undersigned.

A. W. LITTLETON, Secretary.

American Gas Light Association.

OFFICE OF THE SECRETARY, PROVIDENCE, R. I., April 19, 1893.

To all Members of the Council :

By direction of the President, I hereby give notice that there will be a meeting of the Council of this Association on May 16th, 1893, at 7.30 P. M., at the Victoria Hotel, Chicago, Ills.

Every member of the Council is urgently requested to be present, as the business to be transacted not only includes subjects concerning the October meeting of the Association, and the special features due to the time and place, but also other matters which are of vital importance to the welfare of the Association. Respectfully,

A. B. SLATER, JR., Secretary.

BRIEFLY TOLD.

THE FINAL PREPARATION FOR THE WESTERN'S MEETING AT CHICAGO.—Secretary Littleton's current circular regarding the preliminaries for Chicago meeting of the Western Association does not differ greatly from that published in our number of a week ago. In fact the only new meat in the Littleton pronunciamento is the announcement that a complimentary banquet will be tendered the Association on the evening of the second day's session ; or Thursday, May 18th. Of course it would be an impossibility for the Western to be seated before anything in the shape of a spread that would not be of the royal order, but it is likely that Mine Host Kinsley, to whom has been allotted the task of preparing the feast and serving the same, will see to it that the Western will enjoy a super royal gastronomic treat. No other caterer in the West can outdo him ; no other caterer in the West has ever outdone him. The matter of arranging a suitable entertainment programme has been very perplexing to the Committee of Arrangements, whose members have, under the alert guidance of that prince of hustlers, Mr. Carl D. Bradley, spared neither labor nor pains to ordain a rational card for the outing time. A very elaborate excursion by boat to the World's Fair Grounds was planned, but the scheme, on closer counselling, was abandoned, in the fear that it would be virtually impossible to get the "boys" together in line when the hour for the return trip was at hand. It may be taken for granted that Jackson Park will be the great magnet for all in the hours that can be spared from the business sessions, and as many would prefer to make up their own parties, for their journeyings to and from the grounds, it looks that the committee acted with wisdom in abandoning the proposed set excursion. The Committee, however, will act as a Bureau of Information, application to whom for information as to how best to "see the Fair" will meet with accurate and speedy response. Those who propose to attend the sessions, whether from the North, South, East or West, ought not to delay in forwarding their applications for accommodations to the proprietors of any one of hotels named in Secretary Littleton's circular.

OBITUARY NOTE—MR. JOHN LEFFERTS.—We regret to report the death of Mr. John Lefferts, of Flatbush (a beautiful suburban town on the central eastern line of Brooklyn), whose demise occurred very suddenly on the afternoon of Tuesday, April 18th. Deceased, whose ancestors settled in Flatbush about the year 1650, was one of the original projectors of the Flatbush Gas Company (the Company was incorporated about the year 1864), and served continuously as its Treasurer. This property, which although seldom heard from by the public, is a very valuable one, and much of its prosperity is due to the care and counsel abundantly given to it by deceased, who was a man of great probity and sagaciousness. Deceased was born in Flatbush in 1827, in the old family homestead (a quaintly charming structure of true Dutch designing, that has often attracted wondering comment from the casual passer by), which stood on the farm, the level plain of which caught the fancy of his ancestors in their search for a resting place in the New World almost 2½ centuries ago. He was, as may well be inferred, intimately bound up in everything that involved the best interests of his native place, and his death will cause many a gap in the business interests that he personally attended to which will be hard to close. The funeral services were celebrated in the Flatbush Dutch Reformed Church (an historic old pile, half facing another old structure notable as the first incorporated college in the State of New York—Erasmus Hall), on the afternoon of Friday, April 21st, the Reverends Dr. C. L. Wells and Mr. William S. Boocock officiating. Interment was made in Greenwood. His widow and seven children survive.

THE COOKING SCHOOL EXHIBIT.—We cannot add much that is new in respect of the progress made by Miss Corson and her co-workers in their arranging for a model cooking school at the World's Fair. This week, owing to the naval exhibition and its concomitants, has been rather a mixed one as to ordinary business in New York City, so we are obliged to put off naming the committee (which it was presumed would have been appointed ere this) that was to be put in charge of the proposed subscription. We can, however, print positive evidence of the interest that attaches to the matter, by presenting the following letter, which explains itself :

NEW YORK, April 17, 1893.

Miss Juliet Corson, New York City : It is with great interest that I have noticed, in the columns of the AMERICAN GAS LIGHT JOURNAL, accounts of your projected cooking school exhibit, to be made at the World's Columbian Exhibition. This is a matter of great importance, both to the women of this country, in their effort to emancipate themselves from the thraldom of the present servant question, and also to the gas profession, who will be called upon to supply the most efficient and economical fuel with which to attain the best results. In behalf of the American Gas Light Association I wish to extend all possible encouragement, and write to ask in what manner we can best assist you. As the Association is national in its character we could not, as a body, devote funds to a *State* exhibit ; still, many of our members are residents of New York, and others are manufacturers of gas cooking apparatus, so that, as individuals, we may be able to give material assistance. If you will kindly let me know how best we can co operate with you, I will gladly bring the matter before my associates. Address me at Brevard, N. C. Respectfully, A. E. BOARDMAN,

President American Gas Light Association.

THE ECONOMICAL GAS APPARATUS CONSTRUCTION COMPANY, LIMITED.—In our advertising columns will be found an advertisement of the business of the Company named in the title, the headquarters of which are 203 Yonge street, Toronto, Ontario. The names of its officers (Mr. W. H. Pearson, so well and favorably known to the fraternity of America, is the chief executive) are guarantees that any contract which it makes will be carried out to the letter ; and we have no doubt the Company will obtain its fair quota of the work for which it shall try. As an evidence of this we may report that the Company is erecting a good working specimen of the Merrifield Westcott Pearson water gas apparatus at Toronto, and has also closed a contract with the Ottawa (Can.) Gas Company for the same style of apparatus, the capacity of the plant to be 200,000 cubic feet per diem.

Notes on the Manufacture of Gas.

[A paper read by Mr. W. Stagg, before the Southwest of England District Association of Gas Managers.]

The following notes on the manufacture of gas are, to some extent, a record of attempts made to promote efficiency and economy of working. Being at one time worried by the frequency with which the sealing liquid in the hydraulic main was reduced to the point at which gas of abnormally low illuminating power was brought over (no less than thirteen times in *one* month), I determined to satisfy myself as to the cause. It was suggested to me that this was due either to leaky bridge valves or to the fact that in some way the tar and liquor siphoned themselves out of the hydraulic main. Neither explanation was sufficient for me. The fitful and capricious manner of its occurrence, first in one hydraulic main and then in another, disposed of the theory that it was owing to leaky valves; and a consideration of the facts satisfied me that it was not siphoned out. Close observation convinces me that, in nine cases out of ten, it is attributable to evaporation. I thought perhaps the partial vacuum due to the pull of the exhauster might aggravate the evil; but I am sure this has little to do with it. The boiling point of tar and liquor is somewhere about 212° F., while the temperature of the gas in the ascension pipe I found ranged from 120° to beyond 365° F. During the earlier hours of carbonizing a charge, the gas would be *saturated* with vapors; but later on the dry unsaturated gas would certainly tend to diminish the seal. Still, the explanation as to the active cause breaks down unless it can be shown to occur with some approach to regularity.

To satisfy myself that the reduction of the seal was due to evaporation I drew some of the hot gas direct from the ascension pipe through a sample of liquor from the hydraulic main contained in a flask provided with a thermometer. The thermometer registered 104° F. After passing the gas for one hour, I found there was no reduction in quantity. Thinking this low temperature resulted from atmospheric cooling through the thin glass, I refilled the flask, and inserted it inside the ascension pipe, and again caused the gas to bubble through the liquor. In one hour all had disappeared. I withdrew it next time after an exposure of only ten minutes, with a like result. I then made a similar test on tar. After an hour, 19 per cent. had been vaporized, leaving as a residue a plastic, pitchy solid. There is little doubt that much less than an hour would suffice for this result. Then came the question: "Why should the seal be preserved for days and weeks, and then suddenly become reduced?" I purposely lowered the seal in the hydraulic main very slightly on one side only of a bench, taking care to keep it up on the opposite side. In 35 minutes the temperature of the gas on the lower side rose 180°—viz., from 170° to the limit of the thermometer (350°), which I then removed for fear of fracturing it; while on the side of the normal seal the temperature steadily fell.

Let us suppose that on one side of a bench of retorts you have careful stokers who clear out the ascension pipes properly after each drawing, but on the opposite side of the same bench you have careless ones who neglect this duty. The bulk of the gas will take the course of least resistance, and a disproportionate quantity will pass off through the hydraulic main on the side of the clear ascension pipes. The temperature here will rise correspondingly, and set up a rapid evaporation. Then, having once started to lower the seal, the ratio of the quantity of gas passing on the side of the reduced seal rapidly increases, with a consequent rise in temperature, until the bottom of the dip-pipe is entirely freed by evaporation, and you arrive at the critical point when air and furnace gases are brought over, to the serious detriment of the illuminating power of the gas. I devised a gauge to indicate the approach of this critical point. An ordinary pressure gauge has one limb connected to the cover of the hydraulic main, while the limb which is usually open to the air is in communication with a pipe passing through the cover of the hydraulic main, and dipping about an inch below the normal level of the seal. While the bottom of this pipe is itself sealed in the liquid, the gauge records the amount of exhaust in the hydraulic main; but should the level of the sealing liquid in the main be lowered, the gauge gradually becomes level.

Such a gauge as this would certainly prove useful in small works; but its application is out of the question where there are 20 or 30 hydraulic mains in action. What, then, is the remedy for this "black beast" of the gas manager, which has a knack of turning up at most inopportune moments? An undoubtedly successful remedy is to provide an artificial supply of liquor. For this purpose a constant stream from a nipple with only a ¼-inch hole is sufficient to compensate for the evaporation in a hydraulic main receiving gas from 40 retorts. Its chief value consists, I think, in preventing the lowering of a seal at its initial stage. I have made an arrangement of this kind, which provides a 1-inch supply pipe to refill the main in case of accident. Finding it essential that the tank supplying this liquor service should not be allowed to run out, I have connected an ordinary 24-inch pressure gauge to the delivery of the pump, to keep the attendant informed, the indicating fluid being mercury instead of water.

I have recently made a number of tests to ascertain what advantage, if any, would accrue from the proposal to remove the tar from the hydraulic main and seal the dip-pipes wholly in liquor. That a liquor seal can be maintained I have proved beyond doubt when the siphon for the removal of the tar is used in connection with this continuous liquor supply. With the overflow of the siphon half an inch below the normal level of the seal, it is possible to maintain continuously in the hydraulic main a surface layer, 4 or 5 inches deep, of liquor unmixed with tar for months together. To ascertain the value of such a seal of liquor over tar, I made some tests upon the illuminating power of gas before and after bubbling through tar, and also through liquor. The effect of liquor upon the gas was simply nil. The tar, on the contrary, reduced the illuminating power in all cases, until the temperature of the tar was artificially raised to 150° F., when the gas was slightly enriched. This enrichment would be due to the distillation of the richer hydrocarbons, which the tar at lower temperatures absorbed from the gas. In actual working these illuminants would have been removed to the tar well during the earlier stage of carbonizing off the charge, and thus lost to the gas.

In seeking for confirmation of the advantage of a liquor seal in practical working, candor compels me to admit that I have found none; although I am certain that the tar has not been within 2 or 3 inches of the bottom of the dip-pipe. I had exceptional opportunity for making test in a setting of eight 20 feet through retorts, carbonizing 8 tons of coal in 24 hours, provided with a separate exhauster, purifying plant, and meter. The coal was actually weighed in, and a 24 hours' test made, first with a liquor seal, then with a seal of ordinary character. The difficulty of being certain that the quality of the coal was the same each day may perhaps introduce an element of uncertainty; but to me it is significant that in all cases the best results were given when working in the ordinary way, with a seal of tar and liquor—and this from each kind of coal and cannel tested upon. It may be that alternate tests of 24 hours are unsatisfactory. Still, one would think that the retorts having carbonized off four charges for each test, the result would be conclusive.

I should like to say a word in favor of controlling the illuminating power of the gas at the exhauster. A jet photometer, with its own small purifier (standardized *in situ* once at least every 24 hours) connected immediately with the outlet of the exhauster, enables the attendant to observe the earliest possible indication of a change in the quality of the gas coming over, and to deal with it directly and effectively. Barring accidents, it is possible with this arrangement to make gas of approximately constant quality. I am sure it is impossible to over rate the value of this method from an economical point of view, whether considered from the saving of foreman's time, or in avoiding the waste resulting from making gas of a higher illuminating power than is required. Any lowering of the seal in the hydraulic main is at once observed, by the consequent abnormally low illuminating power indicated; whereas, when the quality is regulated at the end of the process of works purification, the whole of the plant is filled with the gas of low illuminating power before its discovery, and hours of low driving are often required before the gas again attains the standard illuminating power.

It is essential that the jet photometer should record correctly; and frequent adjustment is therefore necessary, to compensate for changes in temperature, atmospheric pressure, and the specific gravity of the gas. Undoubtedly, this adjustment is best done *in situ*, and can be readily accomplished by having a connection made with the gas tested at the bar photometer. I consider the practice of raising or lowering the water line, in order to standardize the jet, an objectionable one. When the jet photometer registers too low, the hole in the burner can be readily enlarged. Should it, however, be already too large a difficulty arises. I have tried plaster of Paris for the purpose of reducing the hole, but not with any measure of success. I have sketched an arrangement which occured to me, and which has proved most satisfactory. The adjustment is made by raising or lowering a needle placed inside the burner tip. With this method of adjustment the pointer should always return to zero when the gas is shut off—thus enabling the foreman at all times to check the water line.

In fixing works' pressure gauges, as far as possible each should be arranged to indicate to a passing eye the actual *resistance* given. Thus,

a washer would be provided with a single gauge combining the inlet and outlet pressure, as is now frequently done with station meters; and the inlet and outlet pressures at the center valve thus combined would indicate the total resistance given by a set of purifiers. I believe, with gauges arranged in this manner, a much less frequent booking of pressures will be rendered necessary, the working condition be visible at a glance, and the foreman be set free to give more attention to the paramount duties of the retort house. I have sketched such an arrangement; and would draw your attention to the left-hand gauge, which has been designed with the object of showing, in adition, the total pressure at the outlet of the exhauster. This appears to me to be necessary, in view of accidentally approaching the maximum pressure covered by the seal in the lutes of purifiers. For myself, I prefer gauges constructed with a sliding scale—the zero being at the bottom of the scale. Having placed this on the lower water line, the pressure or resistance can be read right off in a straightforward manner.

Let me add a few notes on the use of carburine (sp. gr. 68) as an enriching agent, instead of cannel. After six months' working with one of Mr. Clark's carbureters, without a single failure, I cannot speak too highly of the system. To enrich gas 1 candle requires 1¼ gallon of car burine per 10,000 cubic feet of gas. The gas carries the carburine perfectly at ordinary temperatures; and there is no deposit even at freezing point.

A series of tests were made with gas carrying 2½ gallons per ton of coal, to determine the effect of cold. The carbureted gas was passing for eight hours through a series of U tubes, immersed first in ice and then in a mixture of ice and salt, giving 200° of frost. As it was necessary that the water vapor present in the gas should be previously removed, calcium chloride was used, this substance having no effect upon the carburine. At freezing point, the U-tubes were found perfectly dry, after the gas had been passing for eight hours. In the freezing mixture there was a considerable deposit—probably one third of the carburine in the gas was thrown down; but under this condition common and cannel gas condense out valuable illuminants, so that we are no worse off in this respect than we should be when using cannel. Gas containing carburine is found to absorb naphthaline more readily than common gas; but at freezing point this useful property fails entirely.

A series of tests have shown that the illuminating power of carbureted gas can be recorded perfectly with the jet photometer. The working vapor tension of the carburine is 20 pounds to the square inch; and ample contact with the heating furnace should be allowed in order to entirely prevert after-deposit. It is surprising how little steam the carbureter uses when it is arranged, as it can be, to discharge only the water of condensation; managed in this way, the steam gives up the whole of its heat.

The question of cost will be determined by local considerations, and practically resolves itself into the difference between the extra cost of cannel over common coal against the cost of the carburine, because the quantity of vapor produced from the latter is not worth consideration. There is, I think, a point of economy in the use of carburine which should not be overlooked, viz., the facility with which the illuminating power of the gas can be maintained at the required standard, without the slightest risk of making and sending out better gas than is actually required. There need be absolutely no waste from this source. Starting with everything cold, four minutes suffice to raise the illuminating power of the gas 1, 2 or 3 candles, as may be required. Only a gas manager can know and feel what a boon this may prove at a critical moment; and I have no need to enlarge, before the present company, upon the value of such an auxiliary in the manufacture of gas.

Coal and Coke Production in Kentucky.

State Mine Inspector C. J. Norwood, in his latest report on the coal and coke production of Kentucky in 1892, states that the total output of bituminous coal for the calendar year was 2,972,640 short tons, 119 mines producing, of which 1,641,445 tons were produced by 111 mines during the last half of the year. This was an increase of 65,328 tons over the output of 1891.

The output of the cannel mines for the calendar year 1892, nine mines producing, was 53,842.86 tons, an increase of 10,802 tons over the output of 1891.

The production of coke for the calendar year 1892 amounted to 36,860 short tons, a gain of 4,167 tons over 1891. This was less than had been expected, the small increase being due to the fact that there was little done at the ovens in the eastern field, there having been an almost total cessation of production at the Bell county ovens during the last half of the year. Of the 18,295 tons produced during the last half of the year, the St. Bernard Coal Company, in the western field, made 17,433. The output of that company has grown steadily, while for various reasons not based on the quality of the coke, the great excellence of which is no longer in question, the production of the Bell county ovens (the only ones as yet in the eastern field) has materially declined. The St. Bernard Coal Company increased its production by 5,033.65 tons for the first half of the year, and by 4,255.50 tons for the last half over similar periods in 1891, a total increase for the year of 9,289 tons, while the output of the Bell county ovens fell off 5,122 tons as compared with 1891.

Inspector Norwood, in conclusion, says that progress in coke making in this State is now solely a question of transportation facilities. When this shall have been satisfactorily solved (and the prospects for its early solution are encouraging) it will be but a matter of a short while until Kentucky becomes one of the leading producers of furnace coke.

Prizes Offered by the Smithsonian Institution.

The Smithsonian Institution, in carrying out the instructions that accompanied a gift to the Institution, from Mr. Thomas G. Hodgkins, of Setauket, L. I., who specified that the income derived from a portion of the gift should be devoted "to the increase and diffusion of more exact knowledge in regard to the nature and properties of atmospheric air in connection with the welfare of man," mentions the following programme. The prizes will be awarded after July 1, 1894, provided the papers submitted in competition are adjudged to be of a nature worthy of the terms of the gift.

1. A prize of $10,000 for a treatise embodying some new and important discovery in regard to the nature or properties of atmospheric air. These properties may be considered in their bearing upon any or all of the sciences—*e. g.*, not only in regard to meteorology, but in connection with hygiene, or with any department whatever of biological or physical knowledge.

2. A prize of $2,000 for the most satisfactory essay upon—
   (A) The known properties of atmospheric air considered in their relationships to research in every department of natural science, and the importance of a study of the atmosphere considered in view of these relationships.
   (B) The proper direction of future research in connection with the imperfections of our knowledge of atmospheric air, and of the connections of that knowledge with other sciences.

The essay, as a whole, should tend to indicate the path best calculated to lead to worthy results in connection with the future administration of the Hodgkins foundation.

3. A prize of $1,000 for the best popular treatise upon atmospheric air, its properties and relationships (including those to hygiene, physical and mental). This essay need not exceed 20,000 words in length; it should be written in simple language, and be suitable for publication for popular instruction.

4. A medal will be established, under the name of The Hodgkins Medal of the Smithsonian Institution, which will be awarded annually or biennially, for important contributions to our knowledge of the nature and properties of atmospheric air, or for practical applications of our existing knowledge of them to the welfare of mankind. This medal will be of gold, and will be accompanied by a duplicate impression in silver or bronze.

The treatises may be written in English, French, German or Italian, and should be sent to the Secretary of the Smithsonian Institution, Washington, before July 1, 1894, except those in competition for the first prize, the sending of which may be delayed until December 31, 1894.

The papers will be examined, and prizes awarded, by a committee to be appointed as follows: One member by the Secretary of the Smithsonian Institution, one member by the President of the National Academy of Sciences, one by the President, pro tempore, of the American Association for the Advancement of Science; and the committee will act together with the Secretary of the Smithsonian Institution as a member ex officio. The right is reserved to award no prize if, in the judgment of the committee, no contribution is offered of sufficient merit to warrant an award. An advisory committee of not more than three European men of science may be added at the discretion of the Committee of Award.

If no disposition be made of the first prize at the time now announced, the Institution may continue it until a later date, should it be made evident that important investigations relative to its object are in progress, the results of which it is intended to offer in competition for the prize. The Smithsonian Institution reserves the right to limit or modify the conditions for this prize after December 1, 1894, should it be found

necessary. Should any of the minor prizes not be awarded to papers sent in before July 1, 1894, the said prizes will be withdrawn from competition.

A principal motive for offering these prizes is to call attention to the Hodgkins Fund and the purposes for which it exists, and accordingly this circular is sent to the principal universities and to all learned societies known to the Institution, as well as to representative men of science in every nation. Suggestions and recommendations in regard to the most effective application of this fund are invited.

It is probable that special grants of money may be made to specialists engaged in original investigation upon atmospheric air and its properties. Applications for grants of this nature should have the endorsement of some recognized academy of sciences, or other institution of learning, and should be accompanied by evidences of the capacity of the applicant, in the form of at least one memoir already published by him, based upon its original investigation.

To prevent misapprehension of the founder's wishes it is repeated that the discoveries or applications proper to be brought to the consideration of the Committee of Award may be in the field of any science or any part without restriction; provided only that they have to do with "the nature and properties of atmospheric air in connection with the welfare of man."

Information of any kind desired by persons intending to become competitors will be furnished on application.

All communications in regard to the Hodgkins Fund, the Hodgkins Prizes, the Hodgkins Medals, and the Hodgkins Fund Publications, or applications for grants of money should be addressed to S. P. Langley, Secretary of the Smithsonian Institution, Washington.

The Portland Cement Industry in Europe.

M. Pierre Giron, in an article recently contributed to the *Engineering and Mining Journal*, remarks that the first known cement factory in England was at Northfleet, on the Thames; another was built about 1825. For many years the manufacture of Portland cement made no advance. Owing to the crude process used then, this new product was looked upon with great suspicion. In 1850 four factories were only engaged in the manufacture of Portland cement; but from 1860 this industry increased until the quantity manufactured in England exceeds 8,300,000 bbls. a year. The annual production of the most important English cement works is about as follows: White Brothers, 550,000 bbls.; Knight, Bevin & Sturge, 450,000; Lee Son & Smith, 450,000; Burnam, 450,000; Robins, 450,000; Johnson, 330,000.

The process of manufacture used in England is very much the same as it was 20 years ago. Few improvements have been realized. The raw materials used in England are chalk and clay, both very pure and readily soluble in water. The quality of the raw materials is considered perfect, and this explains how with inferior methods of manufacture English manufacturers succeed in producing a satisfactory cement.

Only one quality of cement is made in English factories, and this includes the whole output of a kiln, less the underburnt clinkers picked by hand with more or less care. But there are different commercial qualities of cement according to the fineness of grinding. Until a few years ago the English cement was put on the market just as it comes from the mills. The sifting operation did not exist, and the result was that the cement usually left a residue of 15 or 20 per cent. on the No. 50 sieve, and 25 to 30 per cent. on the No. 80 sieve. The progress in grinding made in other European factories has led English manufacturers to improve their own grinding facillties, but still the English cement, as a rule, is far from being as finely ground as the German and French Portland.

The manufacture of Portland cement was introduced in Germany by Mr. H. Bleibtreu, who, in 1852, established at Stettin the Zulchow works, which made from 25,000 to 30,000 bbls. a year until 1856. He built, at about the same time, another cement mill at Obercassel, near Bonn on the Rhine. These two establishments still exist and produce yearly from 160,000 to 200,000 bbls.

New works were built soon after, and there are now no less than 60 large Portland cement works; the annual production in Germany is about the same as in England, 8,500,000 bbls. The production of the most important German cement works is about as follows: Alsen & Son, Hamburg, 550,000 bbls.; Dyckerhoff & Son. Amoneburg, 500,000; Germania Cement Fabrik, Manske & Co., 450,000; Schifferdecker, at Heidelberg, 450,000; Mannheimer, at Mannheim, 450,000; Pommerscher, Guistorp, at Stettin, 400,000.

The development in Germany of the cement industry is not due, as in England, to the favorable quality of the raw materials; on the contrary, in many of the German works the materials used are difficult to handle, but German manufacturers have made great efforts to produce an article of reliable quality, and to develop in their works the most progressive methods of manufacture. They have organized themselves into a public association; they admit foreign manufacturers among them, and in their meetings they discuss questions relating to the manufacture and quality of cement. Thus the researches and studies made in one establishment serve all others. This association of manufacturers is one cause of the development of the cement industry in Germany during these last few years.

The works of Messrs. Dyckerhoff & Son, at Amoneburg, near Biebrick on the Rhine, were built in 1863; within a few years the annual production attained 100,000 bbls.; in 1883 the output was 400,000 bbls., and now the yearly production is 500,000 bbls. The raw materials used here are a nearly pure but very hard carbonate of lime which is found in the vicinity of the works, and a certain marl very rich in clay, which comes from Florsheim to the works by boat. These materials are often analyzed and the proportions of their admixture carefully determined. The laboratory of this establishment deserves special mention. Its installation is perfect, and the experiments which are made under the supervision of Mr. R. Dyckerhoff and Dr. Schuman have contributed a great deal in Germany to enlighten manufacturers and users on the properties of Portland cement.

In France the Portland cement industry did not grow as rapidly as in England or Germany. In 1880 the whole production hardly exceeded 750,000 bbls. a year; it is now, however, 1,800,000 bbls. It was only in about 1850 that Portland cement commenced to be used in France, when Messrs. Dupont & Demarle started the manufacture at Boulogne-sur Mer in the North. They had previously spent several years in experiments to find out the best way to use the chalk marl in that vicinity which is still the raw material they use. In a comparatively short time Mr. Damarie succeeded in finding a process so perfect that it is still followed, and the composition of the cement has not been changed.

The reputation of the cement manufactured at Boulogne is inferior to none in Europe. The works of the Company of French Cements alone manufacture about 800,000 bbls. a year, being the largest of the kind in the world.

In Russia the first cement works were built at Polen in 1857. There are now 12 of importance; 8 of them make Portland cement, the others only natural cement. The total production of Portland cement in Russia is about 900,000 bbls. a year. The three largest works are: Schmidt, at Riga, 140,000 bbls.; Port-Kunda, Eshstand, 140,000; Grodziec, Polen, 140,000.

In Belgium there are Portland cement works, making altogether about 800,000 bbls a year; the largest being those of the Societe Anonyme de Niel, Ruppel, making 400,000 bbls. yearly.

In Italy the manufacture of Portland cement does not properly exist. Several works make a kind of natural Portland cement by burning cement rock to a little higher point than common cement. The two largest factories are located at Cazale and Bergamo. In Switzerland there are several Portland cement works, but a so-called natural Portland cement is mostly what they manufacture. In Austria there are only a few establishments producing Portland cement, and their product has acquired little reputation. There are five Portland cement works in Denmark, and their output reaches 300,000 bbls. a year. In Sweden 4 factories produce annually 425,000 bbls. One establishment in Norway makes 80,000 bbls.

The total annual production of Portland cement in Europe is estimated at 20,000,000 bbls.

Coal Dust Explosions as a Motive Power.

Reports from Germany are to the effect that Herr Krupp, the famous gun maker, is now building a number of experimental engines to test a novel idea. A German inventor has taken patents on the utilization of the general principle that finely divided carbonaceous matter floating in the air readily explodes. He proposes to grind coal to an impalpable powder, and after introducing the dust floating in the air into the cylinder of an engine, explode it, the idea being to follow very much the same lines which are being so thoroughly developed in the use of gas in engine practice.

Naturally, the first question which has risen has been how to get rid of the ash. Krupp is reported to have stated that his experience in gun manufacture convinces him that this is not a serious obstacle. The advantages which would grow out of a direct utilization of mineral fuel as mined are very obvious. While modern practice converts only 10 to 15 per cent. of the heat energy stored in coal into power at the crank shaft of a steam engine, it is believed that no less than 75 to 80 per cent. could be made available by the direct combustion of the fuel through explosion of coal dust.

Clark's Retort Lid.

On February 14th, United States Letters Patent (No. 491,769) were granted to Mr. Josiah P. Clark, of Boston, Mass, for an improvement in the manufacture of retort lids. Using the words of the specification, the invention relates to improvements in retort lids, more especially in those adapted to be used in gas works, and has for its object to produce a lid, easily operated and light, which can always be seated gastight against the mouth of the retort when the lid is closed and fastened.

It consists in providing the lid with mechanism whereby it can be moved upon the face of the mouth of the retort, at the same time being forced against such face, thus removing any dust, tar, lampblack or other substance from between the meeting faces of the lid and mouthpiece, and forming a gas tight joint between such faces.

It consists, also, in minor details of construction, as will be set forth hereinafter and illustrated in the accompanying drawings, wherein—

Fig. 1 represents a front elevation of a mouthpiece and lid of a retort provided with my improvements, showing the lid in its open position and having a portion of the lid broken away, exposing a part of the operating mechanism.

Fig. 2 represents a horizontal section of the same on the line *A—A* in Fig. 1.

Fig. 3 represents a front elevation of a mouthpiece and lid of a retort provided with my improved attachments, showing the lid in a closed position.

Fig. 4 represents a horizontal section of the same on the lines *B—B* in Fig. 3.

Fig. 5 represents a vertical cross section of the lid on the line *C—C* in Fig. 1.

Fig. 6 represents a vertical section on the line *D—D* in Fig. 1, showing the manner of hinging the lid to the mouthpiece of the retort.

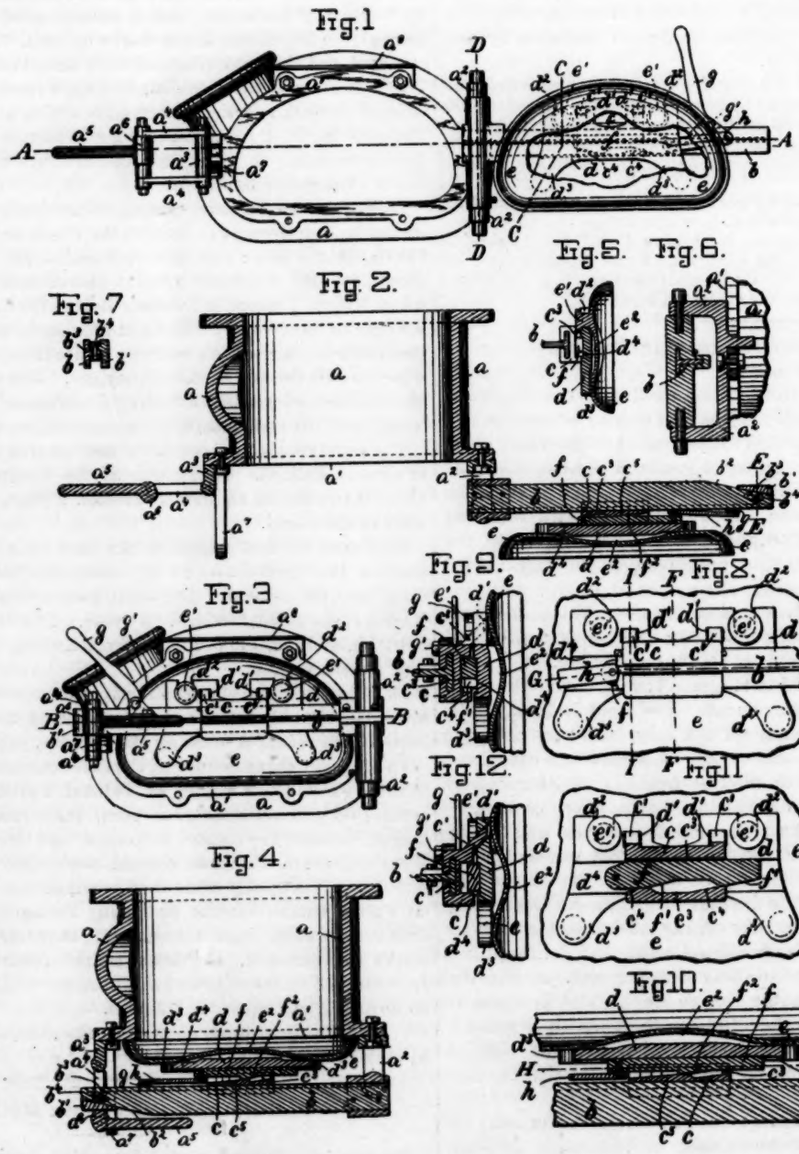


Fig. 7 represents a detailed cross section on the line *E—E* in Fig. 2, showing the manner of adjusting the amount of force with which the lid is held against the mouthpiece and of compensating for the wearing of said parts.

Fig. 8 represents a detailed front elevation of the mechanism employed to produce a tight joint between the faces of the lid and mouthpiece of the retort.

Fig. 9 represents a vertical cross section on the line *F—F* in Fig. 8.

Fig. 10 represents a horizontal longitudinal section on the line *G—G* in Fig. 8.

Fig. 11 represents a vertical longitudinal section on the line *H—H* in Fig. 10.

Fig. 12 represents a vertical cross section on the line *I—I* in Fig. 8.

Similar letters refer to similar parts wherever they occur on the different parts of the drawings.

Heretofore the joint between the lid and mouthpiece of a retort has been made tight either by luting said joint or by having the faces of the lid and mouthpiece planed or ground to a surface and held together by the application of direct pressure of the lid against the mouthpiece. The luting of the joints has proved to be expensive, laborious and otherwise unsatisfactory, and has been abandoned at most gas works on this account, and the method of planing or grinding the joint and applying the pressure to the lid has been adopted, but by the use of this latter method one is not always sure of getting a gastight joint on account of the particles of tar, lampblack or other substances which are liable to get between the meeting faces of the lid and mouthpiece and preventing them from being pressed tightly together. To remove these particles and insure a tight joint is the principal object of this invention.

The mouthpiece *a* of the retort is provided with the face a^1, which is planed or ground to a true surface in the usual manner. To one side of the mouthpiece is adjustably attached the bracket a^2, to which is hinged the T-iron bar *b* forming a support for my improved device, described hereinafter. To the opposite side of the mouthpiece *a*, to where the bracket a^2 is attached, is adjustably secured a second bracket a^3, to which is pivoted the links a^4 a^4, between the outer ends of which is pivoted the locking handle a^5, the inner end of which is made cam-shaped or eccentric, as shown at a^6 in Figs. 2 and 4. The handle a^5 is adapted to press against the end of the bar *b*, or against an adjustable seat piece b^1 attached thereto, when in the position shown in Fig. 4, exerting a pressure upon the lid *e* and holding it firmly against the face a^1 of the mouthpiece. The bar *b* is preferably provided at its outer end with this seat-piece b^1 made adjustable upon the incline b^2 on the end of the bar by means of the slot b^3 in the bar and the bolt or set-screw b^4 passing through said slot and into the seat-piece. This allows the device to be adjusted at this point to compensate for any wear or to vary the pressure of the lid against the mouthpiece. It will be seen that if the pressure exerted by the operation of the handle a^5 is not sufficient to hold the lid gas-tight, it is only necessary to loosen the bolt b^4 and to adjust the seat-piece b^1 farther up on the incline b^2. Upon the T bar *b* is placed the block *c*, which is provided with a groove into which the bar is inserted and fastened by pins driven through said bar. The block *c* is provided with two or more upwardly inclined projections c^1 c^1, which pass through perforations d^1d^1 in the plate *d* and support said plate. To this plate is hung the lid *e* by means of two or more grooved lugs e^1e^1, projecting from the outside surface of the lid and resting in the forked notches d^2d^2 on the upper edge of the plate *d*, as shown in Figs. 5 and 8, which plate enters the grooves on said lugs and prevents the lid from being accidentally detached from said plate without first

raising the lid out of the forked notches, but still allows the lid to be easily and quickly removed and replaced by another lid should it become broken or unfit for use. The plate d projects downward preferably in the form of two horns d^2 d^2, which rest against the outer surface of the lid or against lugs thereon. The incline of the lugs c^1 c^1 which support the plate d tends to keep the plate against the inner surface of the block c, and any separation of said plate from said block, from any cause, will, on account of said inclined projections, tend to raise said plate, and with it the lid e hung thereon; but they will be at once returned to their normal position by the weight of the lid and plate when this cause of separation is removed.

The raising and lowering of the lid, when it is closed, against the mouthpiece of the retort, and before the handle a^5 is operated to press the faces of the lid and mouthpiece together, cause the lid to move up and down upon the face of the mouthpiece and against the same, removing any dust, tar or other substance from between their faces and insuring perfectly gastight joint when the pressure is applied by the handle a^5.

The movement of the lid above described I accomplish by the introduction of a wedge shaped bar f between the block c and plate d, which wedge rests within the groove c^3 on the inner surface of the block, and the groove d^4 on the outer surface of the plate d. This wedge is provided on its under side with inclines f^1 f^1 which co-operate with inclines c^4 c^4 on the lower surface of the groove c^3 on the block c as shown in Fig. 11, to help raise and lower the plate and attached lid when the wedge is moved forward and back in the groove, as these inclines cause the upper portion of said wedge to press against the upper surface of the groove d^4 in the plate d, as shown in Fig. 11. The wedge is also provided on its outer surface with the incline f^2, which co operates with the incline c^5 in the groove on the block c as shown in Fig. 10, to separate the block c and plate d and thereby to press the lid against the mouthpiece and allow it to rock independent of the T-bar and to seat itself fairly upon the mouthpiece. The wedge f is reciprocated longitudinally within the grooves c^3 and d^4 by means of the hand lever g pivoted at g^1 to the bar b or to a bracket attached thereto, and the link h connecting the hand lever with the wedge. The hand lever is provided with a handle by which it can be rocked upon its pivot by the operator in order to reciprocate the wedge.

The operation of my improved lid is as follows: Starting with the several parts in the relative positions shown in Figs. 1 and 2, and the retort charged ready for the lid to be closed, the operator swings the lid and T bar, with their attachments, to the positions shown in Figs. 3 and 4. He then grasps the handle a^5 and carries it over the end of the T bar so that the cam a^6 will rest upon the seat piece on the bar; he then rocks the hand lever g with one hand so as to remove any substance from between the faces of the lid and the mouthpiece in order to form a gastight joint between said faces, at the same time turning the handle a^5 with the other hand to the position shown in Figs. 3 and 4, so as to cause the cam a^6 to press against the seat piece, forcing the lid firmly against the mouthpiece and locking it in this position.

I do not wish to confine myself to the exact mechanism shown for moving the lid upon the face of the mouthpiece, nor to the direction in which said lid is moved as they may be varied within the scope of mechanical skill and any well known equivalents used without departing from this part of my invention, which consists broadly in providing mechanism to cause a movement of the lid upon and against the face of the mouthpiece of the retort so as to remove any dust, tar, lampblack or other substance from between the meeting faces, and insure a gastight joint.

To prevent sagging of the T-bar and to guide the lid to its proper position on the mouthpiece, I provide the bracket a^3 with the projection a^7, upon which the T-bar b rests when the lid is closed. This projection is made inclined on its outer end so as to raise the end of the T bar as the lid is closed. This projection also limits the movement of the handle a^5 when the handle is brought over the end of the T-bar in locking the lid.

Heretofore the lids of retorts have been made flat, and the desired amount of strength obtained by supplying them with a number of projecting ribs, but this coustruction is faulty, on account of the unevenness of expansion of the different parts of the lids when heated, causing the lid to warp and the joint between it and the mouthpiece to leak. To obviate this difficulty, and also to make the lid lighter, I form the lid of equal thickness throughout, or approximately so, and obtain the desired amount of strength by concaving the lid, as shown at e^2 in Figs. 2, 4, 5 and 10. This causes it to expand evenly as it is heated, and prevents it from warping.

A shelf or guard a^8 is attached to the mouthpiece in such a position as to prevent small pieces of coal or dust from dropping into the operating mechanism when retorts above are charged.

The Reynoldsville (Pa.) Coal Field and a Novel Drainage System.*

One of the most important coal producing districts in Pennsylvania is the Reynoldsville coal and coke region, located in the eastern part of Jefferson county. The seam now being worked is the Lower Freeport, with an average thickness of 5½ feet. It lies in parallel troughs, which trend to the northeast and southwest. In appearance the coal is lustrous and compact, cokes well, is free from iron pyrites, and is an ordinarily good gas coal. The increase of the output is an evidence of the value of this coal for steam making, as it is used almost exclusively for this purpose. In 1886 the total amount produced was 1,023,186 net tons, and for 1891 it reached 3,160,614 tons, while the output for 1892 exceeds this. The principal shipments are to northern and northeastern markets. The largest mine in the region is situated near Reynoldsville, and takes its name, Big Soldier Run, from the stream on which it is located.

The place selected for the opening of the slope is on the northwest side of the trough, or coal valley, not far from the anticlinal lying between the Reynoldsville sub basin and Reynoldsville basin proper. By boring, the lowest point in the coal valley was found to be near Sykesville, a village two miles distant. Levels were taken and it was ascertained that the dip of the seam was 218 ft., and the surface at the same point was found to be 102 feet below the bottom of the seam at the slope opening. This condition of affairs suggested, to the engineer in charge, a scheme for cheap drainage, which was carried out as follows: The seam was opened up at the crop, and a random line run from this point along the highway to the point near Sykesville. From data thus obtained an angle was calculated, giving the course of a straight line that would join the two points. The difficulty in running a perfectly straight line, for nearly two miles, through a hilly and wooded country, was here encountered, and three attempts were made before the line was completed. At the crop end a heading was started, on line 9 feet wide, also three others, running parallel, two on the right and one on the left, all to be used as roadways. Ground was then broken at the Sykesville end for a shaft, rectangular in form, 12 × 16 feet, so located that the straight line would pass diagonally through the two corners of the rectangle. Two large boilers and a hoisting engine were then put in place, and the work progressed. In sinking the shaft first loose earth had to be cribbed, and next hard sand rock was met requiring drilling and blasting; and then the water in great quantities. After procuring two double cylinder duplex pumps, each having a capacity of 420 gallons per minute, work was resumed, and the shaft went slowly down, until the coal seam was uncovered, and the bottom reached, at a depth of 116 feet.

To carry the surface line to the bottom of the shaft, enough fine steel wire was obtained to make two plumb lines, that would reach from the top to the bottom. It was absolutely necessary that this wire should be fine, and yet strong enough to hold a given weight and not stretch. The weights, weighing 12 lbs. each, were suspended, one at each corner of the shaft, and the wires carefully placed in line, on the surface, with the transit. The instrument was then taken to the bottom. The plumb-bobs, however, would not remain quiet, but kept up the motion of a long pendulum. Two pails of molasses were procured, and the weights were suspended in these, and at last ceased to vibrate. After numerous mishaps, from various causes, the heading line was established to meet the one being driven from the slope end. Before starting the main heading away, two cross headings at right angles with the main were driven, and off from these several rooms were turned and mined out, to make water room. This, in the event of anything happening to the pumps, would allow the men time to escape before the main entry filled.

Having decided to drive the headings with machinery, two Norwalk air compressors were procured, one for each end; also several Harrison mining machines, or "Iron Men," as the miners call them. A single heading was driven from the shaft end, and the air carried to the face by a wooden box, 20 inches wide by 36 inches high; this box was grafted on in 16 ft. sections, as the work advanced, and through the whole distance furnished a good supply of fresh air at the face of the workings. For 370 feet the work progressed well, and no obstacles were encountered; a few feet more and a rock fault was struck; geologically speaking not a rock fault, for the strata remained intact. The coal seam had been washed or cut out, and sand deposited in its place, which ultimately became very hard rock, and 120 feet of this rock were gone

* By Mr. Frank M. Brown, in the *Engineering and Mining Journal*.

through before coal was again found. About 420 feet further on more rock of the same description was found. In this no progress of account was made, till an Ingersoll drill was purchased, and then an average of 5 feet a day was made. The natural rise of the seam was kept, and occasionally a hole was drilled down as well as up, but with no signs of coal.

After going on in this manner for 300 feet, it was deemed advisable to ascertain what was ahead, and a point was located on the surface, 330 feet ahead of the face, and a hole bored 230 feet deep, which showed 7 feet of coal. This was encouraging, and the work was pushed on. No coal was found until within 12 feet of the hole, and then the full height of the seam, but 12 feet further on the coal again disappeared. To the writer this was proof positive that prospecting by boring here and there a hole does not tell the entire story. In this case, had the hole been located 15 feet either backward or forward, no coal would have been found; and again several holes a few hundred feet right and left of this heading line showed full thickness of the seam, while the work in the heading actually went through 1,000 feet of solid rock. After tunneling 120 feet more in the rock, coal was again found. Here the Ingersoll drill was exchanged for the mining machine, and from this end the work progressed at the rate of 30 feet a day.

At the slope end, the progress was slow. Four headings were carried along, and from two of these, the outside ones, rooms were turned, and entries driven both right and left. The water was a constant source of trouble, and so heavy was the grade that a mule could pull but one loaded car at a trip. For months not more than 2 feet a day was averaged, and so the distance between the two ends was lessened, until one day a shot was heard by the shaft heading men from the slope. Careful measurements demonstrated the distance through to be 399 feet. At 200 feet, the mining machines could be plainly heard.

From both ends the miners were kept on line by means of sights. These were plumb lines suspended from plugs, driven in holes drilled in the roof, and carefully placed in line by the engineers. It was found to be necessary to set these sights ahead every 200 or 300 feet, to keep them near the face. This was often difficult because of the smoke from the powder used in blasting, and inability to so light the plumb lines as to be seen with the transit. A small error in this work would have thrown either end off from the line, but when the headings were driven together, so closely did they meet it would require a practiced eye to discover where they joined. The distance driven from the shaft end was 5,200 feet, and from the slope 3,900 feet. The time from the beginning to the completion of the work was nearly three years.

Levels were taken, and it was ascertained that an elevation equal to the depth of the shaft would pass up the heading 4,500 feet, and should the shaft be allowed to fill to the top, there would still be left above water level 4,600 feet from the slope end. The heading was now cleared of pumps, pipes, rails and everything valuable, and this scheme for drainage was accomplished. The shaft is now full and overflowing, and 2,500 acres are being drained without cost of pumping. As soon as all the coal above water level is mined, which will be many years hence, the water can be pumped out, and the balance of the territory mined.

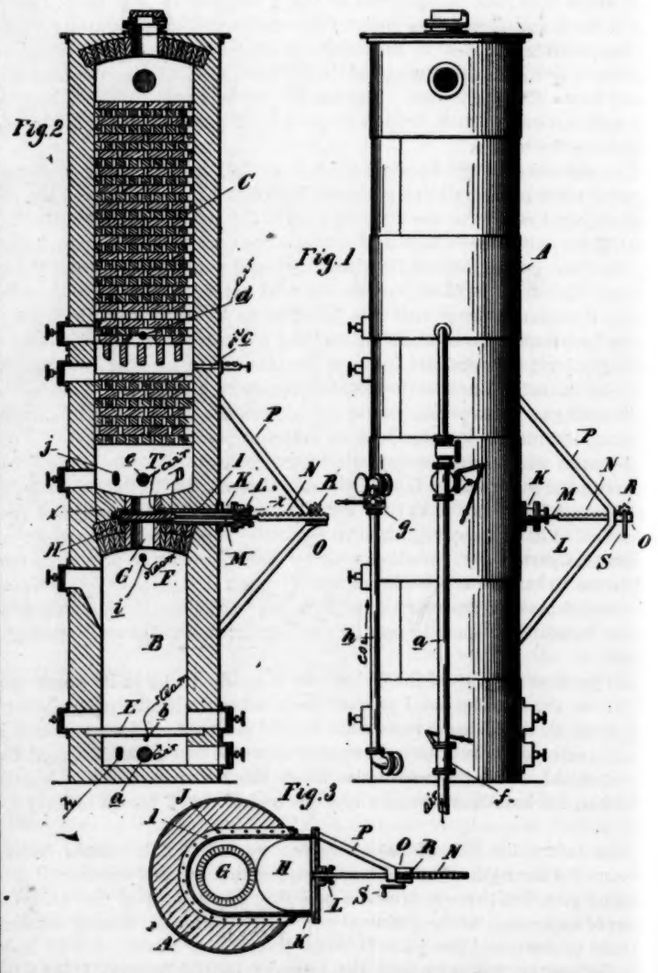
The reason why this field was not mined from the shaft was that the company owning it already had a railroad constructed nearly to the slope end; and several large shafts, with machinery in each would have to be constructed to hoist the desired output. Besides, if all the coal should be taken out at the shaft, then all the water from the entire field would have to be pumped; now 2,500 acres can be mined without pumping. The heading had to be straight, in order to put in a peculiar haulage system. The idea of cable traction is an old one. It was first employed in mines, and wire rope was first used for this purpose in Saxony, as far back as 1830, but in this, as in everything else, there have been improvements.

The haulage system at Big Soldier Run is laid out on a large scale and with the best machinery. The buildings are substantial, of brick and stone. The boiler house is 80 by 38 feet, and contains a battery of six boilers of 100 horse power each. The stack is built of brick, 13 feet square at the base and 11 feet at the top, and is 103 feet high. The flue is 5 feet square, and holds its size from bottom to top. Adjoining the boiler house is the engine house, 100 by 30 feet. This building is only one-half completed yet. When done, it will contain four double engines, each pair working an endless rope. The rope coming from the mine takes several wraps around the large driving wheels, and returns to the mine, where it passes around a bull wheel, to return again. The train of mine cars is attached to the rope with a grip, similar to those used on street car lines, and a trip of 60 loaded cars, of 2 tons each, can be hauled up this heavy grade in a few minutes. The rope does not run continually in the same direction, but has a reciprocal motion. The engines are reversible, and as soon as a trip is brought out, the engines are reversed and a trip of empty cars are taken in. The engines are controlled by two men, occupying positions in towers erected for the purpose, on top of the engine building. From this position they are enabled to see each trip as it emerges from the mine, 1,100 feet distant. The rope delivers each trip to a large structure called the tipple building. Here it is dumped into chutes where it passes over screens, and is divided into lump, nut and slack, each kind being delivered into cars ready for shipment. There are six of these dump places, two of which have no screens. Coal loaded from the latter is known as "run of mine." This structure is built of iron and steel; its length over all being 140 feet and its width 56 feet. The distance from the ground to the eaves is 45 feet. The approach is 90 feet long by 36 feet wide. The whole structure rests upon a substantial foundation, laid in cement. Underneath are seven tracks, extending up a slight grade for half a mile above the chutes, which constitute the yard for the storage of empty cars. For loading, the cars are dropped into place by gravity. Here, as soon as the mine is brought up to its full capacity, 350 cars, or about 8,000 tons, can be loaded each day.

Morrell's Gas Manufacturing Apparatus.

On April 18th U. S. Letters Patent (No. 495,900) were granted to Mr. Edward E. Morrell, of Chicago, who subsequently assigned the same to the National Gas and Water Company, of the same city. Using the inventor's words:

This invention relates to new and useful improvements in gas manufacturing apparatus, and relates especially to that class of apparatus



designed to manufacture so called water gas, either for fuel or illuminating purposes, and the invention consists in the peculiar construction of a cupola, comprising a combustion chamber, a superheating chamber, a connecting passage and a valve for controlling said passage, so that gas can be made by an up blast or a down blast through the combustion chamber, and further in the peculiar construction of the valve used in

controlling said passage, whereby it may not be burned out in the use of the apparatus.

The invention consists further in the peculiar construction, combination and arrangement of the various parts as more fully hereinafter described and claimed.

In the drawings, Figure 1 is a side elevation of a cupola embodying my invention. Fig. 2 is a vertical, central, longitudinal section of Fig. 1. Fig. 3 is a cross section on line x x in Fig. 2.

A is a casing preferably cylindrical in form and also preferably containing within a single vertical casing a combustion chamber *B* and a superheating chamber *C*, the two being separated by a partition or cross wall *D*. The superheating chamber is preferably filled with open brick work as is usual in such constructions, and the combustion chamber provided with suitable grates *E* and doors for filling and emptying and working with the fire therein.

F is an arch formed at the top of the combustion chamber and forming a portion of the partition, and *G* is a passage way connecting the combustion chamber with the superheating chamber.

H is a valve controlling said passage way. This valve preferably consists of a single casting of suitable size to close the passage and to engage in a seat or bearing *I*, which is recessed in the wall of the passage way and is preferably formed by a yoke shaped metallic channeled frame *J*, as plainly shown in Fig. 3. This is preferably made in two parts, extending to the outside of the cupola and there provided with a bonnet *H* and a stuffing box *L* in said bonnet, through which the valve stem *M* passes. This stem at its outer end is provided with a rack bar *N*, which is guided in bearings *O*, supported by the braces *P*, secured to the side of the cupola.

R is a pinion meshing with said rack bar, and a suitable crank handle *S* is connected to said pinion for rotating the same to move said rack bar and with it the valve in or out to open or close the passageway *G*.

It will be seen that the inner edge *T* of the side of the frame in which the valve slides is recessed in the walls of the passageway, so that it is some distance back from the direct line of the blast. When valves have been arranged in previous constructions in passages where the heated air from the combustion chamber was delivered, the seat would frequently burn out and cause trouble and cost for renewals. By arranging this seat in a recess in the walls of the passage and arranging the valve so that when it is retracted its edge is withdrawn from the edge of the passage, the blast in passing therethrough does not heat it to a destructive point, and a valve of this kind will have a much longer life with efficient service than any other.

In using my apparatus, the valve *H* being open, the combustion chamber being charged with coal, a blast of air is fed through the pipe *a* which enters beneath the grates. Steam is also admitted through the aperture *b*, the air and steam passing through the combustion chamber through the passage *G* and into the superheating chamber, and at the proper time oil is injected through the injector *c* into the superheating chamber.

Supplemental air pipes *d* and *e* may be used to supply air to aid in the combustion in the superheating chamber.

In the manufacture of fuel gas the valve *H* is closed, as is the valve *f* controlling the pipe *a* and the valve *g* in the by-pass *h* is opened. Steam being admitted through a pipe discharging at *i*, at the top of the combustion chamber, will cause a downward draft through the fire, which will find exit through the pipe *h* and around the combustion chamber outside of the cupola, and will enter the superheating chamber through the aperture *j*. Thus, with a single charge in the combustion chamber, by simply reversing the operation of the device and shutting off the oil supply, I make fuel or illuminating gas as desired.

Wasted Coal in English Mining.

Mr. Walter J. May says that in manufacturing business close supervision will usually prevent undue waste, but in some cases the fuel will pay for washing or some other process for the recovery of the waste. The fuel waste in towns from domestic sources cannot be prevented, but the calorific power could well be utilized in some form, so that a useful and remunerative return could be made. The writer does not suggest any method of obtaining the result aimed at, but certainly the dust and refuse collected from the better class of houses in towns shows a very large percentage of both unburned coal, and cinders having a good value as fuel. In a pamphlet issued by the Refuse Disposal Company it is suggested that by adopting the method suggested therein 20,000 tons of house dust could be made to produce power equal to an engine of 1,183 indicated horse power working for 4,734 hours, or practically 13 hours per day all the year round. Probably this assertion is open to discussion, but the question of utilizing household waste is worthy of consideration.

Much waste is made at many mines, partly from not working in the best manner, and partly through leaving a large amount of slack in the workings. Improved methods of working, where such are possible, will practically prevent loss in getting, as the whole of the coal would then be worked out eventually; but the question of slack is one which needs some attention. In some cases as much as 30 per cent. of slack is left behind and otherwise wasted, and assuming that the seam is 4 feet 2 inches thick, this would represent 15 inches in thickness. Taking coal of a specific gravity of 1.25, each inch in thickness represents about 126 tons 12 cwt. per statute acre, and 15 times this is, of course, 1,899 tons. Taking the general waste in all seams, probably the average would give from 3 to 4 inches in thickness of actual coal as being wasted in each seam underground, but while practically no waste occurs at some pits, at others the waste is very large. This waste can be stopped—first, by working out all the coal without leaving pillars to be crushed and become of no value, and secondly, by clearing out all slack made, both of which can be done in the majority of cases without too seriously increasing the costs of working. It may be objected that this would produce too large an amount of dirty slack, but seeing the results obtained by modern washing appliances at North Motherwell and other collieries, it cannot be said that such increase in output need yield anything but a profit if properly dealt with, and where pyrites are fairly abundant, they will wholly or in part pay the costs of dressing. In every case where the coal is a coking one, all below ¾ inch can be coked, and all above sold, and although the price of coke may be reduced somewhat, such would not be disadvantageous to trade, as furnace men can well have some reduction of cost of fuel, while so long as a coke is not made at a loss, or at least so long as a small profit is made, colliery owners should not be too ready to complain, as the cost of getting slack to bank is not great, and with a sufficient supply it can be graded and cleaned for under 6 cents per ton, including all costs. Roughly speaking, the crude slack can be brought to bank for about 18 cents or 25 cents per ton, including all charges—hewing, of course, would not be increased or charged on the slack—and taking a slack with 20 per cent. removable waste, and allowing the charges to be 30 cents per ton on the crude slack, the total cost of the clean coal would only amount to 39 cents per ton, while the average value may be taken as quite 75 cents, because the larger sizes would have a comparatively high value as compared with the smudge and coke making sizes. There is no earthly reason why we should be wasteful in getting and handling coal because our predecessors used to waste fuel in getting it, as we have appliances never dreamed of 50 years age, while our forefathers had to make the best of the appliances they then had. Thousands of tons of coal are annually wasted, without any valid reason for such waste, by users of fuel, and hundreds of thousands of tons are needlessly wasted at mines, a large portion of which waste is caused by the men themselves. Yet with a little care the production of excessive quantities of slack could easily be prevented, as a rule. Being a question of a contentious character between master and men, the writer does not go into the question of culpability in leaving it in the workings, but will be content with saying that not 2 per cent. of coal should be left behind in the getting, and none whatever should be wasted on the surface.

Abstracts from the Address of Mr. Duesbery, President of the Eastern Counties Gas Managers' Association, England.

* * * The buying and storing of coal is one of the first and most important items we have to deal with. I think it is advisable to buy coal of the best quality (at a fair price), especially where gas of a high illuminating power has to be supplied, as, except the value of the coal in the pit unworked, all charges for labor, plant and carriage are the same per ton for inferior as for better coal. The last item—the carriage—forms a very considerable part of the total cost of the coal used in this district; it being at Cambridge 42 per cent., and, if cheaper coal was used, it would, of course, be more. This argument also holds good in regard to the expenses of storing and carbonizing. Better coke is also made from the better coals, the good quality of which, I find, greatly increases the local sale. The cost per 1,000 cubic feet of gas made from the best class of coal will work out very favorably with that obtained from coal of an inferior quality. Buy, as far as possible, coal with which you are well acquainted, or have strongly recommended to you, and let your specification be fair, but very firm. It is also advisable to buy from different coal fields if possible, so as not to have your supply altogether cut off in the event of district strikes.

I think it would also be to our advantage if gas managers generally

would buy and receive coal in more regular consignments. In storing, the better coal, again, has an advantage; as, being free, or nearly so, from pyrites, there is really very little risk of firing. In proof of this, notwithstanding that we keep very large stocks of coal, I have never seen or heard of any signs of heating whatever, and this where no means of ventilation are taken. Of course, in most cases the small depth of the coal would prevent firing. As the labor in the coal fields is still in a very unsettled condition, and likely to be so, consequent on the demands of masters and men, it has become a necessity to lay in large stocks, so as to have on the works (in case the supply is entirely stopped) sufficient coal to carry us over the next six or seven weeks. This large stock is also, in my humble opinion, much better under cover, and will well repay the outlay of capital on the necessary sheds for this purpose. The coal sheds should be in close proximity to the retort houses, and should be well built, lofty, the floors solid and dry, and slightly higher than the surrounding ground. By having our coal under cover, we are thus enabled to carbonize dry coal at any time when necessary through low heats, which have been produced by using fresh wet coal. A large percentage of the sulphur compounds is left in the coke when dry coal is carbonized, which, if the coal was wet, would be carried to the purifying plant. The deterioration of coal, consequent on exposure, is also considerably reduced. Now that such large stocks of coal are necessary and general, it entails a large amount of labor in storing and removing the same, so that conveyers or aerial ropeways will doubtless come largely into use, except in very small works, as they will tend to decrease the cost of manufacture—in fact, mechanical appliances are coming into general use throughout the whole of the works, with very beneficial results, particularly in the retort house.

As to fireclay goods, I certainly think that the best quality should be used, as the same arguments hold good here as with coal; very often good labor being almost thrown away on bad material. I also recommend, where possible, that a good stock should be on hand, the same to be under cover.

I should be pleased to see a committee formed for the purpose of fully considering the sizes and patterns of retorts, with a view to making standard sizes and patterns, and so reduce the hundreds now in use. This step is certainly necessary; and, if a proper and workable basis could be decided upon, I feel assured that it would be of great benefit to the gas industry at large. This would, of course, apply chiefly to clay retorts, and partly to brick retorts; the latter being preferred by some engineers.

There are very many good systems of retort settings, but without doubt the recuperative system is by far the best, both for economy of fuel and results of carbonization. Either the recuperative system proper, or a modification of the same, may be used with great advantage on even the smallest works. I do not know of a single failure where this system has been tried, provided that the settings have been built with care, and on a good plan, and that materials of the requisite good quality have been used. The first outlay of a recuperative setting is certainly heavier. But the expenditure for repairs is very much less than for an ordinary setting; and the coal carbonized per mouthpiece for the total time in use is more than doubled, notwithstanding that only the same amount of coke for fuel would be required in each case. Both the make per ton and the illuminating power are also increased by the regular heat that is obtained. The ascension pipes should be of large size, and a good distance from the face of the setting, which, I think, is a great preventative of stopped pipes. The hydraulic main should have a shallow liquor but large gas space, and carried independently of the stack; also fitted with apparatus for the immediate removal of the tar and regulation of the seal, which should be small, so that the exhausters can be worked at a level gauge or very little suction. The main should be provided with screens lying on the top of the liquor, to keep the same from oscillating, and consequently the dip normal. The foul main should be of large size, both in diameter and length; so that the gas may be gradually cooled before coming to the condensers. Sudden fall in temperature causes great deposition of valuable hydrocarbons; and consequent deterioration in illuminating power.

At my works the gas passes through the exhausters before coming to the condensers—an arrangement that seems to answer remarkably well; the tar acting as a lubricant. The condensers should be capable of being regulated, so as to keep the gas at a normal temperature under varying conditions of the gas and atmosphere. Condensers of the annular type, or one of the several patterns of water condensers, are best adapted for this purpose. I give my preference to the latter, both on account of space and efficiency. The warm gas, on entering an annular condenser, is subject to the action of a cooling agent of the same low temperature as exercises its influence on the cooled gas as it leaves the apparatus; while in a water condenser the temperature of the cooling agent is lowest where the gas is in a cooled condition—*i. e.*, at the gas outlet, and highest at the gas inlet. The gas and the water pass through the condenser, entirely independently of each other, and in opposite directions; the water absorbing the heat of the gas, its temperature being raised, while the temperature of the gas is, of course, reduced. But the chief point is that we have the gas cooled by an agent with a lower temperature, the degree of which varies in direct proportion with the temperature of the gas; the water as it leaves the condenser near the gas inlet having a temperature approaching that of the gas itself. Thus we have very gradual and almost perfect condensation.

Any of the best types of washers are efficient—being capable of removing the whole of the tar from the foul gas also other impurities; but some have the disadvantage of causing much back pressure. Of the various types of scrubbers, I think the tower scrubbers, filled with boards on edge, are the most efficient, especially if worked in pairs; liquor being used in the first and clean water in the second. The weak liquor, on leaving the second (having removed the last traces of ammonia and a little carbonic acid and sulphureted hydrogen), can, with advantage, be run into a cistern, which also receives the liquor from the hydraulic main and the condensers. This liquor can then be pumped to the top of the first scrubber; and, as it contains a large percentage of free and combined ammonia, it will remove a large quantity of the sulphur compounds and carbonic acid.

The purifiers should be of large area—say, one superficial yard of grids to every 1,000 cubic feet of gas produced per 24 hours with the maximum make; with an adequate space for the gas between each layer. A set of six purifiers, I think, is best, so as to have working at one time (except when emptying) four lime boxes (the first two for the elimination of carbonic acid, and the second two for the sulphide of carbon) and two oxide boxes for sulphureted hydrogen. Much material, labor and nuisance are saved by the admission into the gas, before purification, of a small percentage of oxygen, either pure or diluted, as in atmospheric air. Either can be employed with great advantage; but the air has to be used with care, as, if a too large percentage is admitted into the gas, it results in a serious reduction in the illuminating power. Oxygen is no doubt the best; and I note that our friend Mr. Barton has drawn in oxygen, so as to keep up constant revivification, and that he has known instances where the purifiers have been charged with fresh oxide and not discharged until the material contained nearly 60 per cent. of sulphur. This is, no doubt an exceptional case; but it shows what can be done under favorable conditions. Not only is there a saving of material and labor by the use of oxygen, but it is also stated by some engineers to improve the illuminating power to such an extent as to obviate the use of cannel. Spent lime in some districts realizes a good price; but at some works it cannot be even given away. We at the Cambridge are unfortunately to be numbered amongst the last-named; and I shall be pleased if one of our members at some future time, will give us a paper on the "Recovery or Disposal of Spent Lime."

A station meter is essential on even the smallest works, both to ascertain the quantity of gas made, and also from that datum to find out the quantity of gas unaccounted for or lost by leakage. Holders should have a capacity at least equal to the maximum consumption for 24 hours; and a reasonable outlay of capital on the holders to obtain this, is amply repaid by the wear and tear saved on the carbonizing plant.

Distribution is a very important part of every gas undertaking; and upon the manner this work is executed depends, to a great extent, the precentage of gas that is (as we term it) unaccounted for. Hence the importance that this work should be carried out in the best manner possible, both as to materials and labor. The trunk mains should be of sufficiently large diameter; and I believe it would be better if the branch mains were not reduced in size to so great an extent as they now generally are. I never lay any mains of less than 3 inches in diameter. The extra cost of the increased size of the mains is only a small proportion of the total cost; whereas the reduction in the leakage account, though less pressure being required, is considerable. I may here state that our unaccounted for gas last year was reduced to a little over 3 per cent. of the total make. The mains should be laid at a depth of not less than 2 feet, so as to avoid breakage; and the gas is thus less liable to the action of frost. This also enables us to lay the services deeper, and with a good fall to the mains.

I find it much the best not to lay less than ¾-inch services up to the meters, which may be either wet or dry—some gas managers preferring one kind and some the other. Dry meters are certainly less trouble and expense, and are not liable to stoppage on account of frost. Lay-

ing service-pipes in V-shapped channels, and covered with hot pitch, greatly prolongs their durability, and will repay the extra trouble and cost. I know some managers who lay galvanized wrought-iron pipes, and others wrought-iron pipes for steam; and they state that in the end they are cheaper than ordinary gas-tubing. In some districts lead pipes are found to be the best and cheapest for services. * * *

SPECIAL ENGLISH CORRESPONDENCE.

COMMUNICATED BY NORTON H. HUMPHRYS.

SALISBURY, April 10, 1893.

Law Cases.—The Dinsmore Process at Widnes.—Oil Gas.

The extreme rareness of the appearance of any consumer of gas in the law courts, as a complainant against a gas company, may be taken as a satisfactory evidence of the fair and just, not to say liberal manner in which users of gas are generally treated. In the United Kingdom there are not less than a million gas bills rendered every three months, and the number of these that are disputed is, comparatively, very small. Two cases of interest in relation to the supply of gas have lately been the subject of litigation. The first of these was outside the domain of the gas company. The landlord of an extensive building let out in flats, had the supply of gas laid on, and measured through a large meter at the point where it entered the premises. He was responsible, and paid the gas suppliers according to the indications of this meter, from which it was distributed to the various tenants, and passed, at the entrance to each flat, through a smaller meter. The landlord not only charged each tenant a rent for his meter, but also added 3d. per 1,000 cubic feet to the price of the gas, as a set-off against the expenses of collection, etc. As the property is of a superior class, and each flat commands a comparatively high rent, it is needless to add that this arrangement is very satisfactory so far as the landlord is concerned. In the earlier days of gas lighting it was not unusual to pay a collector 2½ per cent. commission. But with the increased demand for gas the practice fell into disuse, because in many cases it was found that the collectors' remuneration was gradually exceeding that of the manager. In many gas undertakings the whole of the disbursement for salaries of manager, clerks, etc., and of fees to directors and others, would be covered by a charge of 3d. per 1,000 cubic feet of gas sold. So it is not to be wondered that, sooner or later, some one tenant should kick at this nice little device and prefer to purchase direct from the manufacturer. A gentleman who had taken a flat, without being aware of this arrangement, took exception on the rendering of the first gas bill. He tendered the amount due on the basis of the company's rate, but this was refused, and eventually the landlord cut off the supply. An action for damages and for an injunction ordering the supply to be restored was then brought by the tenant, who was successful in both points, and the landlord learned that there is a distinction between a private individual and a public company, and that the latter alone have power to compel payment by threat of discontinuing the supply. The interesting question of "that extra 3d." was not decided, and it remains to be seen whether the landlord will care to bring a civil action against his tenant for the full amount of his claim.

The second case reminds me of the ancedote of a celebrated lawyer, who was shown a handbook entitled, "Every man his own lawyer." He quickly altered the title to "Every fool his own client." A certain consumer of gas thought he knew better than the gas company. It appears that only wet meters were supplied on hire in this particular district, and perhaps that was the reason why the gentleman in question chose to provide himself with a dry meter, and to demand a supply of gas through it. The gas company claimed the right to take the meter to their offices and test it, as provided by the Sales of Gas Act. This request was refused on the ground that the meter had already been tested, and when the company refused to connect the gas supply, they were sued for failure to supply. In the law court the obstreperous consumer got the worst of it, for he lost his case on the grounds that the company request was fair and reasonable, and that he had failed to prove that the meter had already been passed as correct according to the provisions of the Act. No gas company would be so foolish as to put a vexatious objection before an intending customer, but at the same time they must jealously guard their rights.

Although the Dinsmore process has not been heard of for some time, it is still used in the town where it was originally introduced, Widnes. The gasworks belong to the corporation, and they have just announced a reduction of 2d. per 1,000 cubic feet, making the present price 2s. per 1,000 cubic feet with a discount of 2d., and a second similar discount to large consumers. Apart from this cheap price the whole of the public lighting is done *gratis*; that is to say, at the expense of the gas consumers. If the cost of this is deducted from the above figure, we arrive at something like the cheapest price at which gas was ever sold, a fact that certainly tells in favor of the Dinsmore process. The Chairman of the Gas Committee, in proposing the reduction in price, alluded to the fact that in over 1,000 towns in the country the price had been incressed on account of the decrease in the value of residuals, and the higher price of coal. At Widnes they had to fight against the same things, but then they employed the Dinsmore process. The reason why! Widnes was the only town where this process could be worked, he ascribed to the ability of their engineer, and claimed that it saved £1,000 per annum in coals. The profit for the past year was £2,600, or about 4¼d. per 1,000 cubic feet, from which it would appear that the working expenses of the Widnes Gas Works are under 1s. 4d. per 1,000 cubic feet of gas sold. It should be stated that the town is most fortunately situated for obtaining cheap and good gas coal. With this official statement as to the saving effected by the process before us, it is to be expected that other gas companies will take the matter up, and it would be interesting to know, in the light of further experience, whether any explanation can be offered as to the causes which led to the process proving a practical failure at Liverpool and other places where it was tried.

In view of the interest now attaching to the use of fluid hydrocarbons, the Southwest of England District Association of Gas Managers have to-day availed themselves of an invitation from the President for the current year—Mr. E. C. Riley—to visit the oil gas works near London, belonging to the Great Western Railway Company, where this kind of gas is manufactured on quite a respectable scale, and used for the lighting of railway carriages. All the principal railway companies have now adopted this system, and the consumption of oil for this purpose throughout the country must be considerable. Crude oil or petroleum is not used, but a refined product of 700° to 800° specific gravity. The retorts used are made of iron; and small, as compared with coal gas retorts, being **D** shape, about 8 inches each way in section, and less than 6 feet long. They are set in pairs or turns, the oil being admitted to the bottom or hottest retort. The vapors travel along to the far end and there ascend to the top retort by a connecting piece, and return to the front end where the ascension pipe is situated. From this they pass to a collecting or hydraulic main, and are condensed, washed and purified in much the same way as coal gas, though there is nothing like a similar proportion of ammonia or of sulphureted hydrogen to remove. Finally, the gas is stored in an ordinary gas holder. From this it is drawn by compressing pipes, and forced into large cylinders similar to steam boilers at a pressure of 10 atmospheres, or 150 lbs. per square inch. From these it can be distributed by its own pressure to cylindrical iron reservoirs fixed under the railway carriages, which are charged to a pressure of 6 or 7 atmospheres. Some of the main reservoirs are mounted on trucks, and can be attached to any train and conveyed to any desired part of the railway system. The illuminating power of the gas as put into the holders is about 60 candle, but of this it loses some 20 to 25 per cent. by compression. This system of making gas is also applied for villages, gentlemen's houses, etc., but it cannot compete in point of cost with coal gas. In the case above instanced the Railway Company have a small coal gas works close by the oil gas plant, where ordinary gas is manufactured for use in their carriage works close by. So it is evident that the high quality oil gas is in no sense displacing ordinary coal gas, but simply coming into use for purposes to which the latter is not applicable. Where compression and a long transit of the gas is necessary, as in the lighting of railway carriages, it is obvious that the best is probably the cheapest.

The process invented by Mr. W. Young, and now in course of trial on a practical scale at the gas works at Peebles, Scotland, continues to attract a great deal of attention, as it is open to the visits of gas engineers and all interested persons. And another process is that of Messrs. Alexander & Paterson, of Kirkintulloch, who are manufacturers of oil gas apparatus. A special feature of their process is the retort, which is a round one, set horizontally. Instead of using double or twin retorts, the oil is admitted by a number of horizontal tubes that extend from the front nearly to the back of the retort. Each tube receives a separate regulated supply of oil, and thus in a manner acts as a small independent retort, as the oil is at any rate vaporized in it. The vapor returns from the back to the front of the retort, passing in contact with the surface, and also with the exterior parts of the tubes in so doing. These gentlemen claim that with oil at 2½d. per gallon, they can produce a 60 candle oil gas at a cost of 3s. to 3s. 6d. per 1,000 cubic feet, and at that price it would be much more economical than cannel as an enricher. Experiments are now in progress with a view of discovering its properties as regards raising the quality of ordinary coal gas. In this con-

nection the success of the experiment will turn upon whether the oil gas is a perfect gas or merely an inferior gas heavily charged with vapors. If the former it may be expected to mix readily with other gases; but if the latter, there will always be a liability to stratify in the holder, or condensation by exposure to cold.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

Mr. W. J. Lynn, who will be remembered from his connection with the Superintendency of the Hamilton (Ohio) Gas Light and Coke Company, has been put in charge of the distribution department of the Mutual Fuel Gas Company, which is extending its mains. Mr. Lynn, likely will have his hands full when this company changes over from its former system of fuel gas, the present intention being to commence the distribution of an illuminating water gas on or before May 10th. It is also said that the net rates will be $1 per 1,000 for gas used for lighting and 75 cents per 1,000 for gas used for fuel.

The following advertisement, which is appearing in the Toronto *Globe*, rather goes to show that Mr. Pearson and his associates in the Consumers Gas Company, of Toronto, are fully alive to the protection and profit that result from selling gas cheaply. The First Vice President of the American Association, however, was always a pronounced advocate of that policy, and we speak by the book when saying that the Consumers' Company will not rest content to stop at 90 cent gas—when the residents by their liberal use of gas place the company in position to announce another "cut," the "cut," will be ordered forthwith. The announcement is appended:

The Directors of the Consumers' Gas Company have pleasure in announcing to gas consumers and the public generally that, on ascertaining the result of the half year's business just closed, they have decided to reduce the net prices of gas, for prompt payment from first April inst., as follows:

	Per 1,000 Cubic Feet.
To consumers of 200,000 cubic feet and under per annum, from	$1.12½ to $1.05
To consumers of over 200,000 and up to 500,000 cubic feet per annum, from	1.05 to 1.00
To consumers of over 500,000 cubic feet per annum, from	1.00 to .90
For gas for stoves, grates and engines, supplied by separate meters, from	1.00 to .90

The extra discount to consumers of over 200,000 cubic feet per annum, will as usual be allowed at the end of each year, on 30th of September. The Directors are satisfied that the above low prices will make gas cheaper than any other illuminating or cooking agent, and thus place it within reach of all classes of the community. According to recently published statistics of American gas companies, the above prices are, with the exception of two or three places in the bituminous coal district, lower than charged by any other gas company in America. The illuminating power of the gas supplied from a 5-foot burner now averages over 21 candles, as compared with 17½ candles when the last reduction in price was made.

The Indianapolis (Ind.) Natural and Illuminating Gas Company, capitalized in $1,000,000, has been incorporated. The objects of the company as stated in the articles of association, are to prospect and bore for natural gas, and to produce artificial gas for light, heat and power. The Directors are Messrs. C. F. Dieterich, E. J. Jerzmanowski, J. H. Benedict, A. W. Brady, Samuel Thorne, A. B. Proal and John R. Pearson. Mr. Pearson is the only resident of Indianapolis on the Board; the others are residents of this city. This Company, whose proprietors it will be noted are all identified with the natural and artificial gas interests of Indianapolis, has no direct or positive connection with the latter, but will carry on its trade, both in respect of artificial and natural gas supply, in the towns of Frankfort, Lebanon and Crawfordsville, Ind. The main offices will be in Indianapolis, and the executive direction of the Company will no doubt be in the hands of Mr. John R. Pearson.

At the annual meeting of the Rochester, (Pa.) Heat and Gas Company, the following officers were chosen: Directors, James H. Cunningham, E. T. Cooper, Hartford P. Brown, Alfred C. Hurst, Jacob H. Martsolf, Robert McLane and H. M. Camp; President, J. H. Cunningham; Secretary, H. P. Brown; Assistant Secretary, George H. Cross; Treasurer, Francis Marrata; Superintendent, Henry W. Camp.

At the regular meeting of the shareholders of the Rochester (N. Y.) Gas and Electric Company the retiring officers were re-elected and a dividend of 3 per cent. on the common stock was ordered, the same to be payable on and after May 1st. It was also determined to authorize a reduction in the illuminating gas rate, in accordance with the following: Bills are to be made out on the basis of $1.40 per 1,000, payment within 10 days to bring in play a rebate of 15 cents per 1,000. The ruling net rate for an illuminating gas supply is $1.40 per 1,000, and all gas used for fuel purposes is sold at $1 per 1,000.

It is said that a movement is underway at Holyoke, Mass., from which an appeal will be made to the Board of Gas and Electric Light Commissioners to order a reduction in the gas rates charged by the Holyoke Water Power Company, which controls the gas and electric light interests of that city. In the year ended June 30, 1892, the average price for gas obtained by the Company was $1.54 per 1,000 cubic feet, which does not seem to be in any sense an excessive charge.

The Court of Appeals of New York, in the case of the Municipal Gas Company of Albany against the Secretary of State, has reversed the ruling of the lower courts, which puts the Company in line to demand that the Secretary of State file its certificates authorizing an extension of the objects of its incorporation, said extension being to take over the business of the Albany Illuminating (Electric) Company, and to exchange the shares of the Illuminating Company for shares in the Gas Company.

The Oxygen Gas Company, of Chicago, Ills., has been incorporated with a capital stock of $1,000,000. The incorporators are Clifford M. White, J. L. Devine and F. King.

The following, from a recent issue of the Worcester (Mass.) *Spy*, will be read with interest—it is the report of an interview between Mr. Lamson, President of the Worcester Gas Company, and a reporter of that paper: "In 1858 the Directors of the Company decided upon a systematic plan for the enlargement of the works, and for the laying of several long lines of large pipes through the city, to connect with the existing distributing systems. The work has been going on ever since, and a large amount of money has been expended. The policy adopted at that time was to put the plant into condition to make a large amount of gas if required, and to make it economically, and when this had been accomplished to gradually reduce the price to the consumers. Although much remains to be done at the works, and another large gas main is necessary from the works out through Main street to New Worcester, the Directors have for some time been considering the expediency of making some reduction in the price of gas, and a short time ago a vote was passed, to take effect on June 1st, making the price of gas $1.70 per 1,000 cubic feet, with a discount of 30 cents per 1,000 on all bills paid on or before the 15th of the month in which they are presented, making the net price $1.40 per 1,000 cubic feet, instead of $1.50 as at present. This price is the same to the city and to the private consumer. One difficulty which the Company has labored under while spending the large sums on general extensions of its plant, has been the gradual and now almost the entire loss of the city street lighting business. The introduction of electric arc lights has gone on rapidly, and while the expenditure of money by the city for street lighting has rapidly increased year by year, the receipts of the Gas Company for city business have correspondingly decreased, and at the same time the taxes of the Company have increased. The Company had often been urged to make a lower price for gas used for cooking and heating, but had never believed in such a policy. There should be one price for all, no matter for what purpose the gas is to be used, and when any reduction is to be made all should share alike. The new main is to start from the works and run through Southbridge, Canterbury, Grand and Main streets, to New Worcester. It will give much needed additional pressure in the New Worcester district. It will start from the works as a 20 inch pipe and terminate in 12 inches at New Worcester. It is probable the main will be laid this season. The new net rate of $1.40 per 1,000 cubic feet, which the Worcester Company has taken voluntarily, is the same that has been adopted by the Springfield Company on recommendation from the State Board of Gas and Electric Light Commissioners."

Too late for publication in the general reading columns of the Journal, came the following letter, from Mr. H. L. Payne, of Cleveland, Ohio, entitled "A Reply." Rather than hold it over for a week, we determined to print it in the item columns. Mr. Payne writes:

To the Editor American Gas Light Journal: Were it not for the gross misrepresentations, collated under the heading, "The Heat Unit Problem," by Review, in your issue of April 17th, I might willingly overlook that anoymous compilation of fact and fancy. The vagaries there displayed, under a pale varnish of verbosity, will mislead only

those who are of the same feather as this unknown genius, incognito; and I merely wish to indicate to the thinking reader whither an argument based upon a correct quotation would lead. All of the deductions of this wonderful compiler, yclept "REVIEW," are based upon comparisons of numerical data, regardless of their proper significance, and the only sane conclusion brought clearly before our eyes is the utter inability of the author to comprehend the subject in hand. In the matter of gas processes I shall make no attempt to discover whether the more credit belongs to the Harris or to the counter Harris process. Let those who make it a business to promote pet schemes, take up the cudgels *pro* and *con*. But, to pursue the wanderings of this prolix "REVIEW," we find a quasi argument founded upon the second sentence of the article. As its equivalent cannot be found in anything, I have said, we may regard the deductions contained in the first page of this homily as lying on a false base. (* * * *) Such an absurd jumble of figures can only be the evolution of a sickly mind. My assuming 14,000 heat units to a pound of coal will find corroboration in that family heirloom to which my critic subsequently refers, "A Manual of Rules and Tables for Mechanical Engineers," by Mr. D. K. Clark, which gives a "pound of average American coal" as containing *over* 14,000 heat units. The main argument of these five columns of words seems to center about the comparison of my figures with those of Dr. E. G. Love. After misquoting the Doctor, he sets down a double column of figures, one at 32° and the other at 62° (this latter should be 60°, if I read correctly in the "Proceedings of the American Gas Light Association Meetings,") and proceeds to draw his self-satisfying deductions. Let us see what is the disagreement, when both sets of figures are calculated to the same basis. One cubic foot of gas measured at 0° C., and 760 mm. bar., would have, if measured at 60° F. and 30-inch bar., only 94.8 per cent. of its calorific power under the first-named conditions. Making this calculation and comparing the reduced values with Love's as quoted, we find :

Substance.	Payne, at 60° and 30"	Love, at 60° and 30"	Difference in Heat Units.	Difference in Per Cent.
H	327.4	326.5	+ 0.9	0.3
CO	323.5	324 7	— 1.2	0.4
CH_4	1009.6	1022.8	— 13 2	1.3
Illuminants*	1919.4	1929.0	— 9.6	0.5
C_2H_6	1764.2	1774 3	— 10.1	0.4
C_3H_8	2518.8	2540.7	— 21.9	0 8
C_2H_4	1586.9	1607.9	— 21.0	1 3
C_3H_6	2378.5	2427.5	— 49.0	2.0
C_6H_6	3703.4	3748.7	— 45.3	1.2

We here see a maximum difference of 2 per cent., and among the four constituents which are comprised in the ordinary gas analysis, a greatest difference of only 1.3 per cent., which variation does not exceed the probable error of the analysis itself. That the real disagreement is so slight I may feel complimented, when we consider the amount of other data which enters into each computation. Is it not singular when we gaze upon that historical collection of figures given by this author (page 559) that two persons should deduce values for hydrogen which differ by less than one unit per cubic foot? It would take too much of your space, Mr. Editor, if I should attempt to untangle the mess of fancies presented in the remainder of this "REVIEW." Consistency is forgotten, and the waggish chatterer behind the screen of an anonymous lion's skin bobs from the shivers of ice to the hisses of steam in his garrulous amusement. Let us pass, feeling assured that the progress of the gas interests towards unanimity and harmonious working will not be hindered by the cavils of this wordy contortionist, bray he ever so loud!—H. L. PAYNE.

* In both cases consisting of 85 per cent. C_2H_4 and 15 per cent. C_6H_6.

ON April 20th occurred the death of the Hon. Edmund S. Fay, of Portsmouth, N. H., who for some time had served on the Directorate of the Portsmouth Gas Company. He was also a Director in the Mechanics and Traders National Bank, and in the Portsmouth Machine Company. He was born, in 1841, in Windsor, Vermont, but had been located in Portsmouth since 1871. He was Mayor of Portsmouth for two terms (1889–1890), and was greatly respected.

A CORRESPONDENT at Jamaica Plain, Mass., writing from there under date of April 24th, says that the proprietors of the Jamaica Plain Gas Light Company are securing a great many customers on their lines for gaseous fuel, the Company agreeing to supply gas for such uses at the special price of $1.50 per 1,000 cubic feet. The public prints are being largely availed of for bringing before the residents the advantages of the use of gas in the kitchen, the advertisements being handsomely illustrated, with an accompaniment of well chosen and well displayed descriptive sentences. Another factor brought to bear in this useful dissemination of gaseous lore for the public is in evidence in the shape of a series of commonsense articles that are appearing in the reading columns of the local weekly—the West Roxbury *News*. Our correspondent adds that Mr. Eugene H. Yorke, who will be remembered from his connection with the Brockton (Mass.) Company, was engaged by the Jamaica Plain Company to assist and supervise the placing of the works in first-class, modern condition, and to that end he is putting in oil-storage tanks and enriching apparatus, half-depth regenerative furnaces, a Wood scrubber, additional Root exhauster and engine, and Standard washer. Oxide purification has also been arranged for. A new holder, double lift, to rest in steel tank, with a storage capacity of 256,000 cubic feet, is also underway. To house this machinery, some new buildings had to be erected, notably a purifying house and exhauster room. The outfit also includes new offices, repair shops, etc.

AT the annual meeting of the Bridgeport (Conn.) Gas Light Company the following officers were chosen : Directors, William H. Hincks, E. G. Burnham, A. C. Hobbs, Horace Nichols, S. C. Trubee, H. L. Clark, W. D. Bishop, W. H. Perry and W. R. Higby; President, W. R. Higby ; Treasurer, F. B. Sammis ; Superintendent, C. H. Gerdenier.

WE understand that the Newark capitalists who have purchased a controlling interest in the shares of the Newton (N. J.) Gas Light Company will greatly improve the plant ; further, that a concession in gas rates will shortly be announced.

MAYOR JACKSON, of Bay City, Mich., in his annual message to the Common Council, stated that the cost to the city of its public electric arc lamps (which are maintained on municipal account) was $8,580. As 165 arcs are kept up, the figures show that each lamp costs the city $52 per annum.

MAYOR PINGREE and the "remaining" executives of Detroit have ordered that the Public Lighting Commission of that city be directed to build, equip and maintain an electric lighting plant, to be operated on public account, "at a cost not to exceed the sum of $800,000."

WRITING of the above also brings to mind a proposition submitted recently to the Common Council by the projectors of the Citizens Gas Company, who petition for the right to establish an illuminating gas works and a fuel gas works (two separate plants, both as to works and distributing systems, all to be operated in connection with the Archer process.) Sections 6, 7, 8 and 9 of the proposition are as follows : "6. Illuminating gas to be full 22 candle power, and to be sold to consumers for 75 cents per 1,000 cubic feet, if paid on or before the 10th day of each month. 7. Fuel gas, *with six times the heating properties of natural gas*, to be sold to consumers for 50 cents per 1,000 cubic feet, if paid on or before the 10th day of each month. 8. Said Citizens Gas Company to make quarterly reports to the Controller, and to pay to the City Treasurer in each and every quarter 5 per cent. of its gross receipts. 9. The city to have the right to purchase said plants on six months' notice, at 10 per cent. above actual cost." Here is richness, to be sure!

THE Thomson-Houston Company, through Mr. Woodworth, of Cincinnati, Ohio, is said to be negotiating with Mr. Starr for the purchase of his gas and electric lighting properties at Richmond, Ind. Mr. Starr asserts that he would be willing to sell these properties to the city at a sum $30,000 less than he would demand or receive from ordinary, everyday capitalists.

DIRECTOR WINDRIM emphatically denies that he favors the discontinuing of the Ninth Ward plant of the Philadelphia gas works and the sale of the site. On the contrary, he insists that the city cannot do without this branch in active service, and urges (very wisely, too), the city to at once put the plant in that state of repair which would enable it to respond to the demands of modern practice.

THE new machine shop for the Eastern Forge Company, of Portland, Maine, is to be designed and built by the Berlin Iron Bridge Company, of East Berlin, Conn. The building, which is to be 57 feet in width by 150 feet in length, will be constructed of brick and iron only, and will be equipped with all the modern improvements.

THE Jackson (Mich.) Light and Power Company has purchased the plant and franchises of the Jackson Edison Light Company, and the consolidated enterprise will be known under the title of the General Electrical Company.

The Market for Gas Securities.

The market for city gas shares during the week was only a nominal one, although the little that was done was on the advancing side. No doubt the naval pageants, on land and sea (if we may be forgiven for that Hibernicism) had much to do with the lack of interest, for the week was badly broken by holidays, and the city was well filled with our relatives from out of town. Consolidated opened to-day at 127 bid, holders asking a quarter point higher. As was said all along in the JOURNAL, this was not the year for dollar gas in New York City, although investors might just as well reconcile themselves to the fact that 1894 will witness the passage of a law creating such a rate. Mutual gas keeps creeping along towards 150, and Equitable is steady at close to the 200 mark. Over in Brooklyn a sort of bear garden party is now on, but there is little doubt that harmony will prevail in the long run. Prices in Brooklyn shares are uneven, although the undertone is strong, notably in Williamsburgh and Nassau. The coming fortnight ought to show something towards the final settlement of the situation in Brooklyn. Chicago gas took on an upward movement this week, the opening in it to-day (Friday) having been made at 86¼. Bay State is very dull and weak at 26 to 27, but we imagine this stock is a purchase at that figure. Baltimore Consolidated is somewhat lower, being quoted at 63 to 63½.

Gas Stocks.

Quotations by Geo. W. Close, Broker and Dealer in Gas Stocks,

16 WALL ST., NEW YORK CITY.

MAY 1.

☞ All communications will receive particular attention.
☞ The following quotations are based on the par value of $100 per share. ☜

	Capital.	Par.	Bid	Asked
Consolidated	$35,430,000	100	127	127¼
Central	500,000	50	90	95
" Scrip	220,000	—	—	100
Equitable	4,000,000	100	198	200
" Bonds	1,000,000	—	106	108
Harlem, Bonds	170,000	—	—	—
Metropolitan, Bonds	658,000	—	110	115
Mutual	3,500,000	100	142	145
" Bonds	1,500,000	—	100	102
Municipal, Bonds	750,000		—	—
Northern		50	—	—
" Bonds	150,000	—	—	100
Richmond Co., S. I.	346,000	50	—	—
" Bonds	20,000	—	—	—
Standard Gas Co—				
Common Stock	5,000,000	100	85	90
Preferred	5,000,000	100	38	40
Yonkers		50	112	—
Gas Co's of Brooklyn.				
Brooklyn	2,000,000	25	128	130
Citizens	1,200,000	20	108⅛	108¼
" S. F. Bonds	320,000	1000	—	103
Equity Gas Light Co.	2,000,000	100	45	—
" Bonds	1,000,000	—	—	75
Fulton Municipal	3,000,000	100	142	145
" Bonds	300,000		102	—
Peoples	1,000,000	10	92	95
" Bonds (7's)	368,000	—	100	—
" " (6's)	94,000	—	100	—
Metropolitan	870,000	100	135	137
" Bonds (5's)	70,000	—	100	—
Nassau	1,000,000	25	170	—
" Ctfs	700,000	1000	99	100
Williamsburgh	1,000,000	50	155	—
" Bonds	1,000,000	—	107	110
Out of Town Gas Companies.				
Boston United Gas Co.—				
1st Series S.F. Trust	7,000,000	1000	82½	84
2d " " "	3,000,000	1000	64½	—
Bay State Gas Co.—				
Stock	5,000,000	50	26	27
Income Bonds	2,000,000	1000	—	65
Buffalo Mutual, N. Y.	750,000	100	110	—
" Bonds	200,000	1000	95	100
Citizens, Newark	1,000,000	50	155	160
Chicago Gas Company.	25,000,000	100	86⅜	86¾
Chicago Gas Light. & Coke Co.—				
G't'd Gold Bonds	7,650,000	1000	85	90½

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in a Western or Southwestern city, where the chances for future development are good. Has had experience with water gas. Best of recommendations from officials of company in which he is at present employed. Address

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State experience. THE WESTERN GAS CONSTRUCTION CO.,

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